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Elliptic Elements of Comet 1882, *I.* By F. J. Parsons.

(*Communicated by Prof. Safford.*)

The accompanying set of elements was derived from the following six normal places :—

G.M.T.	Mean R.A. 1882·0.	Prob. Error.	No. of Obs.	Mean δ 1882·0.	Prob. Error.	No. of Obs.	Time of Normal Places.
Mar. 26·5	271 36 46·9	±0·71	63	37 15 15·6	±0·41	61	Mar. 19–Apr.
Apr. 12·5	281 22 16·7	±0·20	70	49 49 15·1	±0·66	70	Apr. 4–Apr. 21
May 25·5	55 55 34·2	±0·45	40	59 36 4·1	±0·28	40	May 21–May 28
June 2·5	66 45 42·3	±0·56	18	44 36 27·1	±0·53	17	June 1–June 5
July 9·5	156 59 16·35	±0·59	27	9 45 17·5	±1·3	27	July 8–July 17
Aug. 7·5	181 46 55·5	±1·17	12	4 14 3·7	±1·3	12	Aug. 1–Aug. 16

From the 2nd, 3rd, and 5th of these normal places a preliminary set of elements was computed according to the methods given in Gauss's *Theoria Motus* as follows :

$$\begin{aligned} T &= \text{June } 10{\cdot}52908 \\ \log.\ q &= 8{\cdot}7836381 \\ \log.\ e &= 9{\cdot}9999998 \end{aligned}$$

$$\left.\begin{aligned} \Omega &= 204^\circ\ 56'\ 18''{\cdot}61 \\ \omega &= 208\ \ 59\ \ 38{\cdot}17 \\ i &= \ \ 73\ \ 48\ \ 34{\cdot}88 \end{aligned}\right\}\begin{array}{c}\text{Mean Eq.}\\ 1882{\cdot}0\end{array}$$

Rectangular Equatorial Coordinates.

$$\begin{aligned} x &= r[9{\cdot}9611128] \sin (126^\circ\ 22'\ 53''{\cdot}24 + v) \\ y &= r[9{\cdot}8608368] \sin (\ \ 61\ \ 11\ \ 47{\cdot}56 + v) \\ z &= r[9{\cdot}9021136] \sin (196\ \ 51\ \ 24{\cdot}51 + v) \end{aligned}$$

With these elements, considering the excentricity equal to unity, comparison was made with all six normal places in order to make the final corrections to the preliminary orbit by means of a least-square solution.

A computation in duplicate by two independent methods gave the following twelve equations of condition given in logarithmic form.

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(*x*)	(*y*)	(*z*)	(*u*)	(*v*)	(*w*)	(*n*)	
9·16489*n*	9·27446	9·95933	9·08991*n*	9·46518	9·44609*n*	0·27560	=0
8·41902*n*	8·98582	9·70896	9·97296	9·83479*n*	9·81569	0·72835	=0
9·36391*n*	9·34675	9·97901	9·52692*n*	9·31175	9·32212*n*	8·58790	=0
8·75669*n*	8·80395	9·44677	8 46007	9·87899*n*	9·88936	9·73240	=0
8·47717	9·19942*n*	9·68374*n*	9·84899*n*	9·39972*n*	9·61464	0·16810*n*	=0
9·84246	9·05283*n*	9·23382*n*	9·84595	7·49914*n*	7·71406	0·12710*n*	=0
9·07512	9·14371*n*	9·48881*n*	9·48238*n*	8·97764*n*	9·37563	0·48150*n*	=0
9·91297	8·85165*n*	8·76015*n*	9·49119	8·15680*n*	8·55479	0·47860*n*	=0
9·49764*n*	9·12382*n*	9·58522	9·60400	9·44058	8·86482	9·03510*n*	=0
8·38859	9·19260*n*	9·78999	0·11026*n*	9·44974*n*	8·87398*n*	9·23040*n*	=0
8·99356*n*	8·99621*n*	9·62963	8·81397	9·61626	8·71295	0·65390*n*	=0
7·44648*n*	9·07909*n*	9·77796	0·16787*n*	9·52880*n*	8·62549*n*	0·78890	=0

Where

$$x = 10000\,d\mathrm{T}$$

$$\mathrm{M}\sin y = d\log.\,q\ \text{(Briggian) or } y = \frac{dq}{q\sin 1''}$$

$$z = d\chi' = d\omega' + \cos i' d\Omega'$$

$$\sin u = de \text{ or } de = \frac{u}{\sin 1''}$$

$$v = d\Omega'$$

$$w = di'$$

It was not thought worth while to apply weights systematically according to the number of observations, but as the last normal place seemed to have considerably less precision than the others, the last two equations were given a weight of 0·5012 log. 9·70000 as a convenient approximation to a weight of one-half. The above equations of condition give the following normal equations:—

1·3521χ	−0·2004y	−0·7279z	+0·5948u	−0·1752v	+0·0742w	−4·0124n	=0
−0·2004	+0·2147	+0·3884	+0·2805	+0·0471	−0·0861	+1·8309	=0
−0·7279	+0·3884	+3·2376	−0·7158	−0·0294	−0·1974	+7·4300	=0
+0·5948	+0·2805	−0·7158	+5·1019	+0·1672	+0·5524	+0·3768	=0
−0·1752	+0·0471	−0·0294	+0·1672	+1·5376	−1·2257	−4·7598	=0
+0·0742	−0·0861	−0·1974	+0·5524	−1·2257	+1·3913	+1·7076	=0

Giving the following values for the unknown quantities:—

$$x = 4''\!\cdot\!4771 \pm 1''\!\cdot\!468$$

$$y = 2\cdot4213 \pm 4\cdot214$$

$$z = -\ 1\cdot4295 \pm 0\cdot875$$

$$u = -\ 2\cdot2662 \pm 0\cdot877$$

$$v = +\ 10\cdot952 \pm 2\cdot495$$

$$w = +\ 9\cdot035 \pm 2\cdot739$$

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Substituting these values in the equations of condition gives for the sum of the squares of the residuals $[vv] = 22{\cdot}02$. In the solution of the normal equations $[nn] = 22{\cdot}09$.

From these unknown quantities the following corrections to the preliminary elements are found.

$$\begin{aligned} d\mathrm{T} &= +\ 0{\cdot}000448 \quad \pm 0{\cdot}000147 \\ d\log. q &= +\ 0{\cdot}0000051 \quad \pm 0{\cdot}0000089 \\ d\omega' &= -\ 8''{\cdot}024 \quad \pm 2''{\cdot}644 \\ de &= -\ 0{\cdot}00001098 \pm 0{\cdot}00000425 \\ d\Omega' &= +\ 10''{\cdot}952 \quad \pm 2''{\cdot}495 \\ di' &= +\ 9{\cdot}035 \quad \pm 2{\cdot}739 \end{aligned}$$

These corrections give, as the most probable values of the elliptic elements—

$$\begin{aligned} \mathrm{T} &= \text{June } 10{\cdot}52953. \text{ G.M.T.} \pm 0{\cdot}00015 \\ \log. q &= 8{\cdot}7836432 \quad \pm 0{\cdot}0000089 \\ e &= 0{\cdot}99998902 \pm 0{\cdot}00000425 \end{aligned}$$

$$\left.\begin{array}{l} \omega = 208^\circ\ 59'\ 33''{\cdot}72 \\ \Omega = 204\ \ 56\ \ 29{\cdot}49 \\ i = \ 73\ \ 48\ \ 41{\cdot}82 \end{array}\right\} \begin{array}{c}\text{Mean Equinox}\\ \text{and Ecliptic}\\ 1882{\cdot}0.\end{array} \qquad \left.\begin{array}{l} \omega' = 196^\circ\ 51'\ 16''{\cdot}49 \pm 2''{\cdot}644 \\ \Omega' = 210\ \ 29\ \ 12{\cdot}25 \pm 2{\cdot}495 \\ i' = \ 52\ \ 57\ \ 41{\cdot}04 \pm 2{\cdot}739 \end{array}\right\} \begin{array}{c}\text{Referred}\\ \text{to}\\ \text{Equator.}\end{array}$$

Rectangular Equatorial Coordinates.

$$\begin{aligned} x &= r[9{\cdot}9611023] \sin (126^\circ\ 22'\ 49''{\cdot}33 + v) \\ y &= r[9{\cdot}8608362] \sin (\ 61\ \ 11\ \ 58{\cdot}04 + v) \\ z &= r[9{\cdot}9021280] \sin (196\ \ 51\ \ 16{\cdot}49 + v) \end{aligned}$$

These elements correspond to a period of about 400,000 years.

Recomputing the position of the comet for the dates of the six normal places, and comparing, gives the following results—the column headed "v" being the residuals obtained by substituting in the equations of condition the values found above for the unknown quantities.

	$\delta\alpha \cos \delta$ $(c-o)$	v	$d\delta$ $(c-o)$	v
Mar. 26·5	+1·36	+1·34	+1·01	+1·00
April 12·5	−0·86	−0·71	−1·31	−1·31
May 25·5	+1·53	+1·52	+0·19	+0·17
June 2·5	−0·61	−0·60	+0·04	+0·03
July 9·5	+0·37	+0·38	−2·33	−2·16
Aug. 7·5	−0·91	−0·95	+4·30	+4·24

The planetary perturbations, being small, have not as yet been taken into account, as I intend to make a more complete discussion of the comet when all the observations have been published.

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Observations of Comet b, 1883 (*Pons-Brooks*), *made at the Royal Observatory, Greenwich.*

(*Communicated by the Astronomer Royal.*)

The observations on September 5 and 26 with the South-East Equatorial (aperture 12·8 inches), and those on October 21 and 29 with the East or Sheepshanks Equatorial (aperture 6·7 inches), were all made by taking transits over two cross-wires at right angles to each other, and each inclined 45° to the parallel of declination.

Observations of Comet b, 1883 (*Pons – Brooks*), *with the S.E. Equatorial. Aperture* 12·8 *inches.*

Greenwich Mean Solar Time 1883, Sept.	Obs.	☄ − ✱ R.A.	Corr. for Parallax in R.A.	☄ − ✱ N.P.D.	Corr. for Parallax in N.P.D.	No. of Comp.	App. R.A.	App. N.P.D.	
d h m		m s		′ ″			h m s	° ′ ″	
5 14 11	M.	+0 42·44		+1 21·0		5	16 33 12·10	25 33 32·2	*a*
		−0 24·90		+8 26·8		5			*b*
			s		″				
26 9 55	M.	+0 15·31	+0·35	+1 20·1	−1·5	4			*c*
		−0 32·44	+0·35	+8 29·8	−1·5	4	16 25 47·29	30 5 54·8	*d*

Assumed Mean Places of the Comparison Stars.

Star.	Star's Name.	R.A. 1883·0.	N.P.D. 1883·0.	Authority.
		h m s	° ′ ″	
a	Oeltz. Arg. (N) 16374	16 32 29·78	25 32 31·6	Oeltz. Arg. (N) 1842
b	Anonymous			
c	”			
d	Oeltz. Arg. (N) 16270	16 26 20·33	29 57 42·7	Oeltz. Arg. (N) 1842

Sept. 5. The comet was a very diffused and exceedingly faint object, becoming more and more difficult as it got lower. The positions are therefore exceedingly rough.

The observations are not corrected for parallax. The effect of refraction is insensible.

Sept. 26. Comet fairly bright; round; no tail; central condensation. Two transits of the first and second edge of the comet were taken to determine the diameter. The mean of these transits gives for the apparent diameter 2′ 21″·0.

The star *c* was very faint.

The observations are corrected for parallax. The effect of refraction is insensible.